
ARM Program Mobile Facility

On-Site Observer's Training Manual

*Shouxian Main Site
China*

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Tropical Western Pacific/ARM Mobile Facility Management Office

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Introduction

The ARM Mobile Facility (AMF) On-Site Observer's Training Manual contains essential information about the Tropical Western Pacific/ARM Mobile Facility Management Office (TWP/AMF-MO), a component of the U.S. Department of Energy's (DOE) Atmospheric Radiation Measurement (ARM) Program. The manual is designed to help Observers at the AMF site to obtain familiarity with the operational details of AMF. The information should also help Observers feel comfortable explaining the ARM Program and the TWP/AMF operations to visitors to the site and other interested public.

This training manual consists of seven units and an appendix. Each unit includes the following components:

- 1) Reference materials relevant to the unit
- 2) Goals for the unit
- 3) Brief summary of the information in the unit
- 4) Exercise activities and questions to ensure the trainee's understanding of the unit

Unit 1: The ARM Program

Reference Materials:

- ARM Program Overview presentation

Goals for Unit 1:

- To be able to explain the ARM program
- To know the main goals for the ARM program

Summary of Information:

1. **ARM** stands for **A**tmospheric **R**adiation **M**easurement. Funded by the U.S. Department of Energy, the ARM Program's objective is to improve complex computer programs that are used to predict global climate and climate change. Those computer programs are called General Circulation Models (GCMs). The most needed improvement is for these models to be more effective in showing how clouds of all types affect heating and cooling of the Earth's surface.
2. **Radiation**, the "R" in ARM, refers to both solar energy (i.e., sunlight) and the heat given off by the surface of the Earth. Solar energy is also called short-wave radiation. The atmosphere and the ground absorb some of the solar energy reaching the Earth, while some other solar energy is reflected back to space by the surface and clouds. The surface then emits heat energy, which is sometimes called long-wave radiation or terrestrial radiation (i.e., coming from the Earth).
3. The ARM program has three goals:
 - Establish field study sites, or ARM Climate Research Facility (ACRF) sites, where scientists can observe the effects of clouds on the way sunlight energy heats the Earth.
 - Develop instruments to measure important details of all the ongoing climatic and weather processes.
 - Use the data from all the sites to model the Earth's climate and improve the models so that the global climate is more accurately predicted.
4. There are four ARM Climate Research Facility (ACRF) sites on the planet:
 - **SGP Site** – Established in the Southern Great Plains (SGP) region (Oklahoma and Kansas states) in the United States.

- **TWP Site** – Established in the Tropical Western Pacific (TWP) region. The TWP site consists of three facilities: 1) Manus Island, Papua New Guinea; 2) Nauru Island, Republic of Nauru; and 3) Darwin, Australia.
- **NSA Site** – Established in the North Slope of Alaska (NSA) region.
- **AMF Site** – Deployed anywhere in the world on a six-month to one-year basis.

Each ACRF site is unique and important in understanding clouds and radiation. An ACRF site has many instruments spread out to cover a large area. For example, the SGP site is about 200 km by 300 km in size, while the TWP locale is about 7000 km by 2000 km. Scientists will need data from all four ACRF sites to figure out how to model the clouds and radiation, although some studies will focus on the data from a specific site such as TWP and AMF.

5. The AMF contains most of the instruments used at the SGP, TWP, or NSA site. The AMF instruments differ in that the AMF is designed to be easily moved from one locale to another. Scientists believe that the AMF needs to be deployed in conjunction with other broader research campaign, or to areas where long-term climatic data are scarce. The deployment locations are determined by reviewing scientific proposals from organizations both within and outside of the ARM Program to bring in the broader science community of the United States and the world.
6. Each ACRF site is an integrated system of instruments, computers, and communication systems designed to capture scientific data. The collected data are sent to the Data Management Center at Pacific Northwest National Laboratory (PNNL) in Richland, Washington.
7. To be successful as a program, we must deliver continuous and accurate scientific data as well as excellent and complete records on operations. We need the operational health and status data of instruments to interpret their effect on the scientific data.

Activity:

Locate the three fixed ACRF sites and the current AMF site on a map.

Questions:

1. What does "ARM" mean?
2. What does the term "radiation" mean in weather and climate studies?
3. What are the three ARM goals?
4. What does "ACRF" stand for?
5. What are some of the reasons scientists think the AMF is an important part of the ARM Program?

Unit 2: Safety and Environment

Reference Materials:

- AMF Site Safety Plan
- AMF Shouxian Site Emergency Contacts Sheet

Goals for Unit 2:

- To know about TWP/AMF Management Office (TWP/AMF-MO) basic philosophy for your safety and care for the environment
- To know how to do your work safely

Summary of Information:

1. Everyone at the AMF site must work in a safe and responsible manner. Your life and health are more important than any data or equipment. We will never knowingly ask you to perform dangerous tasks. If you ever receive a request to do a task that seems dangerous, do not do it. Instead, call or send e-mail to let us know the situation. If you see your coworkers (e.g., another Observer, TWP/AMF staff member, etc.) do something dangerous, stop them and tell them that it is not safe.
2. Observers, as well as other AMF site visitors, have specific worker authorization. They are listed in *AMF Site Safety Plan*.
3. It is very important to take care of the environment surrounding the AMF site. Do not allow anyone to pollute or litter. Help us be good guests and visitors by being clean and safe.
4. When dealing with electrical systems, remember the following restrictions:
 - Do not work on electrical power.
 - Do not open a power cabinet unless directed to do so by a qualified person.
 - Do not disconnect instruments for replacement without reading how to turn off power first and following an appropriate procedure.

Note: When performing a new task, ask for guidance and a written procedure.

5. If you or a coworker gets hurt, get help immediately. Then call or send e-mail to TWP/AMF-MO to let us know what happened.

6. Review the Emergency Contacts Information below (also posted in each Van) and know how to phone and send fax to TWP/AMF-MO.

Emergency Contact Information

Police	110
Fire Department	119
Ambulance	120
Emergency Medical Clinic/hospital	Phone: 0564-402-1007 Shouxian County Hospital
Mike Alsop (On-Site Technician)	Phone: +86 136-4106-7741 E-mail: mike.alsop@tbpl.com.au
Mr. ZHANG Su (Shouxian Site Manager)	Phone: 0551-229-0021; 1351-560-8438 E-mail: hfzhangsu@163.com
Ms. TIAN Hong	Phone: 0551-2290278; 1395-600-1366
Ms. Coco (Secretary, IAP)	Phone: +86 10-8299-5071 E-mail: coco@mail.iap.ac.cn
Mr. Larry Jones or Mr. Kim Nitschke	Phone: +1 505-667-1186 TWP/AMF Management Office (24-hour answering service) Fax: +1 505-667-9122 E-mail: ljones@lanl.gov or nitschke@lanl.gov
U.S. Embassy in Beijing	+86 10-6532-3831 (main)
American Citizen Services at Embassy in Beijing	+86 10-6532-4153
American Citizen Services at Consulate in Shanghai ..	+86 21-3217-4650, ext. 2102, 2103, 2114
Australian Embassy in Beijing	+86 10-5140-4111
Australian Consulate in Shanghai	+86 21-5292-5500

Activity:

1. Learn where the local emergency phone numbers are posted.
2. Phone and send fax to TWP/AMF-MO as a test.
3. Read the entire *AMF Safety Plan*.

Questions:

1. Which is more important, taking care of instruments or your safety?
2. What is your work authorization? What are the limits of the work you do?
3. List some of the hazards of the AMF site.
4. Is it acceptable to work on electrical systems if the AMF data system is at risk?
5. If a coworker is doing something that may be dangerous, what should you do?
6. What do you do if someone gets hurt at the AMF site?

Unit 3: Workplace Rules and Protocol

Reference Materials:

- AMF Safety Plan
- AMF Visitor Sign-in Sheet
- Work Shifts

Goals for Unit 3:

- To learn about workplace rules and protocol

Summary Information:

1. Always work safely as per *AMF Site Safety Plan*. Never work at the site alone.
2. Consult the on-site technician on a technical and safety issues.
3. Only allow entry to authorized visitors – no friends or relatives without official permission.
4. All visitors must review *AMF Safety Plan* and sign acknowledgement that they have read it and agree to follow it.
5. All visitors must be approved by the on-site technician. Out-of-town visitors and visiting scientists should submit an official Site Access Request online at <http://www.db.arm.gov/SARS2/>.
6. Work to pre-scheduled shift hours. Be on time and launch balloons on time.
7. For all personnel and work-related issues, report to your supervisor.
8. Be on time for your work shifts:
 - Day Shift 1: 06:30 – 10:00 CST
 - Day Shift 2: 12:30 – 16:00 CST
 - Night Shift 1: 18:30 – 22:00 CST
 - Night Shift 2: 00:30 – 04:00 CST
9. At the end of each work shift, send a short e-mail message summarizing balloon launch, weather, and any comments.

Activity:

1. Discuss how to get in touch with fellow Observers in case of emergency.
2. Exchange contact information with fellow Observers.

Questions:

1. What are your work shifts?
2. Whom do you report to about work-related issues?
3. What do you need to do if you cannot make your scheduled work shift because of such events as illnesses and family emergencies?
4. Can anyone visit the AMF site at any time?
5. What does a visitor have to do first on his/her visit to the AMF site?

Unit 4: AMF Instruments and Systems

Reference Materials:

- AMF Instrument Book
- Site Plan with Vans and instruments noted

Goals for Unit 4:

- To learn the location of each instrument and system
- To learn the acronyms for the instruments and systems
- To gain basic knowledge about what each of the instruments and systems measures

Summary of Information:

- See information in *AMF Instrument Book*.

Activity:

1. Walk through the AMF site identifying each system.
2. Practice giving each other short presentations on what the instruments are called and what they measure – You can use *AMF Instrument Book* as a reference.
3. Identify what equipment is with the AMF and what is not.

Question:

Fill in the work sheet on the following pages, using your own words wherever possible.

Instruments/System Work Sheet

Instrument	Full Name	Location	What is its function? What is measured?
PSP Unshaded		SKYRAD Stand	
B/W Shaded		SKYRAD Stand	
PIR Shaded #1		SKYRAD Stand	
PIR Shaded #2		SKYRAD Stand	
NIP		SKYRAD Stand	
IRT Up-looking		SKYRAD Stand	
MFRSR		TSI Stand	
PSP Down- looking		GNDRAD Tower	
PIR Down- looking		GNDRAD Tower	
IRT Down- looking		GNDRAD Tower	
Temp/ Humidity Sensor		SMET Tower	
Barometer		Inside SMET Logger Box	
ORG		SMET Tower	
Wind Sensor		SMET Tower	
PWD		SMET Tower	
AOS		A1 Van	

Instruments Work Sheet (continued)

Instrument	Full Name	Location	What is its function? What is measured?
MWR		Field	
MWRP		Field	
MWRHF		Field	
CIMEL		Field	
CEIL		A2 Van roof	
MPL		A1 Van	
WACR		A2 Van	
ECOR		ECOR Tower	
BBSS • Computer • DigiCORA • Launch Cart		MET Building	
MFRSR Logger		TSI Stand	
SKYRAD Logger		SKYRAD Stand	
GNDRAD Logger		GNDRAD Stand	
SMET Logger		SMET Tower	
GENSET (Emergency Generator)		A3 Van	
RWP		A2 Van / Field	

Instruments Work Sheet (continued)

Instrument	Full Name	Location	What is its function? What is measured?
AERI		A1 Van	
2NFOV		A2 Van roof	
SAM		Field	

Unit 5: Balloon-Borne Sounding System (BBSS)

Materials:

- AMF BBSS Launch Operations at Shouxian Site, PRO(BBSS)-022.008
- Launching Second Balloon, PRO(BBSS)-024.003
- Compressed Gas Cylinder Handling at AMF, PRO(OPS)-031.003

Goals for Unit 5:

- To obtain basic knowledge about the Balloon-Borne Sounding System
- To learn how to prepare a radiosonde for one of four daily launches

Summary of information:

1. The Balloon-Borne Sounding System provides vertical profiles of both the thermodynamic state (i.e., temperature) of the atmosphere and the wind speed and direction. The data are collected by a radiosonde attached to a weather balloon. The main components of the BBSS are a radiosonde, a balloon, an antenna to receive data (shown above), and DigiCORA, a computer program that collects data from the radiosonde.
2. At the AMF China-Shouxian site, a radiosonde is launched four times a day:
 - 1) 05:30 UTC (13:30 CST)
 - 2) 11:30 UTC (19:30 CST)
 - 3) 17:30 UTC (01:30 CST, next day)
 - 4) 23:30 UTC (07:30 CST, next day)

Note: Launching a radiosonde on time is the most important task for AMF Observers.

Activity:

1. Review AMF BBSS Launch Operations at China-Shouxian Site, PRO(BBSS)-022.008.
2. Closely observe the launch demonstration.

Questions:

1. What kind of data does the BBSS collect?
2. How many times per day will you be launching a radiosonde?
3. What are the scheduled times for launching a radiosonde?

Appendix A: TWP/AMF Acronyms

2NFOV	2-channel Narrow Field of View Zenith Radiometer
ACCESS	Automated Communication Control and Environmental Supervision System
ACRF	ARM Climate Research Facility
ADaM	ARCS Data and Management System
AERI	Atmospheric Emitted Radiance Interferometer
AMF	ARM Mobile Facility
ANL	Argonne National Laboratory
AOS	Aerosol Observation System
ARCS	Atmospheric Radiation and Cloud Station
ARM	Atmospheric Radiation Measurement
BBSS	Balloon Borne Sounding System
BNL	Brookhaven National Laboratory
B/W or B&W	Black and White Pyranometer
DOE	U.S. Department of Energy
DS	Data System
ECOR	Eddy Correlation Flux Measurement System
ENSO	El Niño Southern Oscillation
GOES	Geostationary Operational Environmental Satellite
HRPT	High Resolution Picture Transmission
IOP	Intensive Operational Period
IRT	Infrared Radiometer
ISS	Integrated Sounding System
LANL	Los Alamos National Laboratory
MAS	Manus
MFRSR	Multi-Filter Rotating Shadowband Radiometer
MPL	Micro-Pulse Lidar
MWR	Microwave Radiometer
MWRHF	Microwave Radiometer – High Frequency
MWRP	Microwave Radiometer Profiler
NCAR	National Center for Atmospheric Research
NIP	Normal Incidence Pyreheliometer
NOAA	National Oceanic and Atmospheric Administration
NSA	North Slope of Alaska
NTS	National Tidal Facility
NWS	National Weather Service
OMS	Operations Management System
PIR	Precision Infrared Radiometer
PNG	Papua New Guinea
PNNL	Pacific Northwest National Laboratory
PSP	Precision Spectral Radiometer
PWD	Present Weather Detector
RWP	Radar Wind Profiler
SAM	Sun and Aureole Measurements
SGP	Southern Great Plains
SKYRAD	Skyward Looking Radiometer Stand
SST	Sea-Surface Temperature
SV	Site Visit
TSI	Total Sky Imager
TWP/AMF-MO	Tropical Western Pacific/ARM Mobile Facility Management Office
VCEIL	Vaisala Ceilometer
WACR	W-band ARM Cloud Radar
WMO	World Meteorological Organization